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ABSTRACT

Guidelines are discussed for developing and selecting instructional materials about ecopolitical issues for secondary schools. Ecopolitical issues arise from human manipulation of the natural environment and include problems resulting from the limited capacity of the environment to satisfy human needs. High school courses that treat ecopolitical issues should emphasize a basic conceptual framework for understanding, interpreting, and making and judging decisions about these issues. This framework should help students to organize, interpret, and appraise information and ideas about the limits to growth debate. In addition, it should help students understand the sociopolitical context of these issues and develop a global perspective on them. Finally, students should have opportunities to develop skills in making and evaluating decisions about ecopolitical issues. Ten propositions are clarified and justified as guides to selection and emphasis of subject matter in secondary school courses in the social studies that include ecopolitical issues. These propositions can also be used as criteria for evaluating treatment of ecopolitical issues in curriculum materials. (JP)

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ECOPOLITICAL ISSUES AND THE SECONDARY CURRICULUM

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Ecopolitical Issues and the Secondary Curriculum

Robert B. Woyach

Broadly speaking, ecopolitical issues arise from man's manipulation of the natural environment. They include problems resulting from the limited ability (or apparently limited ability) of that environment to cope with man's activities or to meet man's needs. During the next 50 to 100 years, the world will probably confront some awesome challenges in this regard.

In the next fifty years, the human population will grow from its current 4.5 billion people to over 8 billion. (Bouvier, 1984, p. 24) The vast majority of these people will be added to the populations of the world's less wealthy societies. Yet, these people will have to be fed, clothed, housed, and provided sources of income sufficient to support culturally acceptable standards of living--whatever they may be.

During this time, the CO2 released into the atmosphere by the burning of fossil fuels may begin to change the global climate. The warming of the earth's atmosphere (the greenhouse effect) may turn Ohio into a tropical rain forest. It may flood coastal cities like New York. (Newsweek, October 31, 1983, p. 89)

The burning of those fossil fuels may also deposit sufficient sulphur di-oxide and other pollutants to kill not only fish but forests in Canada, the United States, and West Germany at enormous economic as well as ecological cost. (Newsweek, March 19, 1984, p. 65)

These are, of course, but a few of the ecological challenges which may confront mankind in the next century. Others include the deadly build-up of toxic wastes, the growing scarcity of petroleum and a number of industrial raw materials, and the loss of farmland to erosion, deserts, urban sprawl and pavement. (Brown, 1978)

This catalogue of problems and issues, has surfaced as never before on local, regional, national and international agendas in the last twenty years.[1]

During this time a new science of ecology has set roots and begun serious study of the effects of man's manipulation and exploitation of the natural environment. Computer models of the world economic system have initiated heated debate over the possibility and desirability of continuous economic growth. They have led to a clear perception of the challenge posed by predicted population growth.

Interest in the ecopolitical issues has also grown among pre-college educators, not only as part of new environmental education curricula, but also as a topic to be taught in the social studies. Guidelines for teaching science-related social issues, a more all-encompassing but clearly related set of issues, has been published by the National Council for the Social Studies. (Science and Society Committee, 1983) School systems in Ohio and Pennsylvania are experimenting with high school Global Issues Courses. Supplementary materials on the principal ecopolitical issues (population, food/hunger, energy, resource scarcity and environmental decay/pollution) have grown exponentially. These issues have even begun to be addressed in major high school social studies texts. (Newitt, 1983)

The interest of educators in ecopolitical issues is understandable. Student interest in these issues tends to be high, and for good reason. These issues clearly have significant implications for the future. Local communities, states, nations, international institutions and individuals themselves must respond wisely to the challenge they pose, or the results could be catastrophic.

Yet, despite the interest of educators in the ecopolitical issues, there has been relatively little discussion, particularly within the context of the social studies, about what should be taught substantively.[2] The lack of discussion is understandable. Global ecopolitical issues are by nature complicated, the debate over them even more so. They are also by their very nature value-ladden, resulting in often bitter controversy. For these very reasons, however, educators need

better guidance to the debate. They need help in identifying balanced substantive treatments of the issues. Otherwise the issues will be dealt with solely by the advocates of "gloom" on the one hand, and the advocates of "boom" on the other.

This paper will develop a parsimonious set of propositions which can be used as a guide through the morass of the limits to growth debate. Hopefully, these propositions can also be used as practical criteria for developing curriculum materials on ecopolitical issues or for assessing the adequacy of existing materials.

THE NEEDS OF THE PRE-COLLEGE CURRICULUM: GENERAL CRITERIA FOR TEACHING GLOBAL ECOPOLITICAL ISSUES

Before articulating a set of propositions on the substance of global ecopolitical issues, it is necessary to ask how these issues fit within the school curriculum as a whole.

The schools can play a useful role in preparing students for citizenship and life in a world that will almost certainly wrestle increasingly with such global ecopolitical issues as hunger, pollution and energy policy. But the schools are not the only sources of information about these issues. Nor do these issues constitute the totality or even the core of the school's educational mission.

The principal implication of these observations is that materials on global ecopolitical issues cannot be all things to all people. They cannot aspire to provide in-depth, technical treatments of each of the major issues (e.g., population, food/hunger, energy, environmental decay, economic development, etc.). Further, in most school systems materials on global ecopolitical issues must fit within an existing high school curriculum whose primary purpose is to teach about American history and government, world history and geography. Even in schools which have Global Issues Courses, those courses must also provide students with a

general introduction to the social, political and economic life of the international system. For very practical reasons, therefore, it is essential to identify substantive criteria for materials which take into account the limits on the role of ecopolitical issues within the existing curriculum.

From this point of view, it can be argued that materials, or for that matter high school courses, on global ecopolitical issues should concentrate on providing a basic conceptual framework for understanding, interpreting and making judgments and decisions about these issues.

Curriculum materials on these issues should avoid the temptation to address primarily affective objectives (e.g., to make students concerned about hunger abroad). They should also avoid the opposite temptation to teach highly technical analyses of current issues or the state of the world with respect to these issues without attending to the basic frameworks which help students to truly understand and make decisions about them.

But what would constitute an appropriate conceptual framework?

First, an appropriate curriculum dealing with global ecopolitical issues should provide an understanding of the fundamental concepts and dynamics underlying the limits to growth debate. Unless students understand the fundamental framework and basic facts related to it, they cannot adequately understand the implications of debates over population policies. They cannot assess alternative strategies of economic growth unless they understand both the constraints which scarcity imposes on society and the latitude which we in fact have in shaping an acceptable future.

Second, and as importantly, materials dealing with global ecopolitical issues must help students understand the socio-political context of these issues. Students must learn about their global context. They should learn why events in far distant places may have an impact on us and why our decisions may have an

impact on others. Students should learn how local, national and international institutions are involved in creating these problems and in responding to them. Finally, especially within the content of social studies classes, students must learn how social, political, cultural and economic forces affect these issues and our responses to them.

Developing curriculum materials which embody these principals is not an easy task. The multi-disciplinary nature of the issues, for example, places imposing demands on curriculum developers, teachers and learners alike. (Bellack, 1965; Patrick and Remy, 1982) Many past attempts to develop issue-related materials for secondary and elementary instruction have failed to provide precisely the kind of intellectual foundations being suggested here. (Panel on School Science, 1980)

Most high school students lack personal experience with global realities. They do not have basic knowledge of international systems, politics, economics or ecological systems. Without a conceptual framework of this type, it will be impossible for students to appreciate the scope of the challenges facing the world. Unless they are armed with this type of conceptual framework, it will be equally impossible for students, as adults, to assess the feasibility and implications of policies designed to respond to these issues.

CONTENT CRITERIA: A PROPOSITIONAL INVENTORY

What is the basic content or knowledge about global ecopolitical issues and their social, political and cultural context? Is there agreement about the questions, if not the answers, in the debate over the limits to growth?

Actually, there is considerable agreement among global modelers, futurists and ecologists about many of the fundamentals of the ecopolitical debate. Of course, there are also important differences. And for this reason, the effort to identify a set of propositions that can provide a conceptual framework is not

without risk. Since the task is to identify elements of agreement and consensus within arguments whose very purpose is to highlight differences, there is considerable opportunity for misinterpretation. At the same time, there is an unavoidable need to gloss over what are, to the scholars themselves and within their research paradigms, important differences in the priority assigned to various elements and in values, assumptions and approaches.

It should also be noted that the following propositions are not meant to provide a curriculum framework or syllabus for teaching about global ecopolitical issues. While it may be that these propositions could be used to organize a course of study, any number of alternative courses of study could conceivably meet the content objectives these propositions implicitly provide. At the extreme, for example, it may be possible to organize a course of study around a single issue such as food policy and achieve all of these content objectives.

These propositions are meant to provide the kind of content framework discussed in the last section. They do not, however, develop the wide variety of other criteria which would presumably apply to these types of materials as well. The NCSS guidelines for science-related social issues, for example, suggests a number of other important criteria. (Science and Society Committee, 1983) One such criterion is that the materials should provide students with opportunities to learn or apply citizenship decision-making skills in relation to these issues.[3] (Patrick and Remy, 1982)

FINITE RESOURCES, TECHNOLOGY AND A SYSTEM OF LIMITS

> Proposition 1: We live on a finite planet, that is on a planet whose ability to produce food and other renewable resources, whose ability to absorb pollutants, and whose ability to provide non-renewable resources for consumption is ultimately limited.
>
> Proposition 2: The physical limits to growth are not fixed in a practical sense. New technologies can push them back. But technology cannot push them back indefinitely.

Proposition 3: Just as the environment is an interdependent system, the various ecological limits to growth are related. Responses to one have implications for others.

There is no fundamental question about the basic tenet of the limits to growth advocates. We live on a planet with finite non-renewable resources and with definite limits as to its physical ability to produce food and other renewable resources (carrying capacity) and to absorb pollutants (i.e., the residue of human activity) on the other. (Cole, et al., 1973, p. 22; Gribbin, 1979)[4] In the world models of the Club of Rome, the most significant physical limits were assumed to be related to food production, the scarcity of industrial raw materials (i.e., metals), and the ability of the environment to absorb pollution (leading to decreases in life-expectancy or decreases in food production). (Meadows, et al., 1972; Cole, et al. 1973) Most analysts would now consider limits to energy resources as a more accurate way of thinking about the limits to industrial raw materials. (Gribbin 1979, p. 141; Pirages, 1978, p. 149)

But key questions remain as to just how critical the challenge posed by these physical limits has become. What precisely are the physical limits of the planet? How close are we to them? In short, precisely what is the extent and nature of the ecological challenge facing us?

From the point of view of experts, the unequivocal answer to these questions is "That depends." It has been estimated, for example, that physically the planet could support a population of 95 billion people if all arable land was put into production and intensive Japanese farming techniques were used. More moderate estimates, assuming the less intensive farming practices of the Dutch, suggest that a population of 30 billion could be fed. But in both situations, many, perhaps a majority, would face chronic malnutrition. Population estimates today suggest that, given current trends, the world's population may level off at around 10 billion people sometime in the middle of the next century. This number

can be fed with existing technologies. But it may well be "close to if not above the maximum that an intensively managed world might hope to support with some degree of comfort and individual choice." (Quotation from the Committee on Resources and Man of the National Academy of Sciences cited by Falk, 1972, p. 134-134.)

One reason for the ambiguity as to how close we are to the physical limits of growth lies in the debate over technology. There is clear agreement that the limits to growth in a practical sense are not those fixed physically by nature. The practical physical limits of the planet are determined at any one point in time by the technologies available to exploit resources and the economics of applying them. Thus it is critical for students to understand the role that technology and the potential for technological change play in assessing the limits to growth. It is equally critical that they see how difficult these factors are to predict and that differences in expectations regarding them lie at the heart of much of the limits to growth debate. (Cole, et. al., 1973, p. 11)[5]

The ill-fated predictions of Malthus that 19th century Britain would be unable to produce sufficient food for its rapidly growing population symbolizes the debate over technology. Malthus failed to consider the potential for expanding food production through the development of improved farming techniques and the development of new grains. (Pirages, 1978, pp.76-77) Of course, he also failed to take into account the opening of new frontiers and food producing areas in the Americas and elsewhere, and the development of transportation and communications technologies which have made possible a truly global food system.[6]

Debates over our ability to feed the world's population in the year 2034 (it is likely to be almost double the population of 1980 or over 8 billion) hinge in part on the question of technological change. Biological engineers are attempting to change the DNA of corn, for example, so that plants will be stronger but

will put less energy into plant production (e.g., leaves) and more into production of additional grain. If bio-engineered strains were produced which used only slightly increased inputs of water and fertilizer, they would significantly push back the limits to our ability to feed growing populations.

However, the ability of technology to push back the limits to growth are not infinite either. A single chunk of coal, for example, has a finite energy budget. New technologies for extracting energy from coal may exploit higher and higher percentages of that ultimate energy budget, but no technology can extract more than 100%. (Sixty percent may be a more reasonable limit for coal used to generate electricity. Ophuls, 1977, p. 113) Likewise, the earth's crust contains only so much coal, whether that coal will last for 100 or 10,000 years at current rates of consumption. When the coal is burned, no technology can replace it.

Of course, new technologies can make new energy and raw material resources available. However, the development of these new technologies, even theoretically feasible ones, are rarely predictable. Significantly expanding the energy budget of the planet, for example, will probably require technological breakthroughs in nuclear fusion or solar technologies. Yet, in both cases such breakthroughs require tremendous investments of capital, time and manpower. Whether those investments are made will affect the likelihood of the technological breakthrough. (See the section below on Political and Economic Limits.)

Likewise, new and more efficient technologies can actually push us closer to new limits as they push back old ones. The use of nitrogen fertilizers has greatly increased food production potential around the world. However, long-term use of these fertilizers is responsible for ground water pollution and the build-up of nitrous oxides in the atmosphere. The latter damage the ozone layer and thus pose a long-term health threat. (Pirages, 1978, p. 188) This suggests

that students also need to understand the interrelatedness and diversity of the various limits to growth.

One of the key characteristics of the current ecopolitical situation is that industrial civilization is facing a number of ecological limits simultaneously. Unlike past prophets of doom such as Malthus, whose concerns were more uni-dimensional, current advocates of no-growth societies argue persuasively that our ecopolitical problem is multi-dimensional. For example, we face limits with respect to a variety of industrial raw materials simultaneously. Thus new technologies which respond to current scarcity often simply face new limits in the foreseeable future. Nuclear fusion would appear to hold a nearly inexhaustible supply of energy for the future. But current efforts to develop fusion technologies assume the use of lithium as a source of fusionable materials. Economical supplies of lithium are already becoming scarce. (Ophuls, 1977, p. 68)

More importantly, we face scarcity in metals at the same time as we face scarcity with respect to energy resources, food resources, and the environment's ability to absorb pollution. There are nearly infinite supplies of industrial metals scattered in the earth's crust. But the exploitation of the vast majority of this resource requires far more energy than could ever be economical.

The systemic nature of the eco-system and of the ecopolitical issues means that decisions made with respect to any one of these issues typically has implications for others. This complicates efforts to devise solutions to any one ecopolitical challenge.

APPROACHING THE LIMITS: POPULATION AND WEALTH

> Proposition 4: Population growth and increasing wealth push us closer to the physical limits of the planet. They do so independently of each other as well as in concert.
>
> Proposition 5: Population growth occurs geometrically, and so does the stress which populations place on the environment. Thus a non-problem today can become an acute problem tomorrow.

Students should understand that the engines of ecological stress, and the ecopolitical issues, are both population growth and increasing wealth. As population increases, so does consumption of both renewable and non-renewable resources, if one assumes at least a constant standard of living. If population grows and overall consumption does not (i.e., the per capita standard of living declines), a limit to growth of some kind has been reached. In many of the poorest less developed countries, for example, per capita GNP has fallen in the last decade. In most of these cases, however, the limits to growth that have been reached are essentially economic, not physical. (Brown, 1978, pp. 198-201)

Nor does population, and its impact on the environment, grow in some simple arithmetic sense. Rather, population tends to grow geometrically. A population growing at a rate of 1.8%, as the world's population is growing currently, will double in 39 years. (Bouvier, 1984) It took thousands of years, until around 1830, for the world's population to reach one billion people. The next billion will be added in only a decade. (Brown, 1978, pp. 72-75) The importance of this geometric growth is that, at higher levels of total population, changes occur more rapidly. The social, political and economic changes which may be needed to support a population of 8 billion people must occur in the next 40 years, well within the presumed lifetimes of today's high school students.

Likewise, even with a stable population, increases in wealth are likely to place greater stress on the environment by increasing consumption. At lower levels of income, for example, increasing wealth typically is associated with attempts to increase the diversity and quality of one's diet. Depending on culture and other factors, more meat is likely to be consumed. Increased meat consumption leads to increased stress on the environment, whether the livestock is grazed on marginal lands or fed grain. (Brown, 1978, pp. 27-37) It thus tends to move a society closer to its physical limits.

The ecological demands of wealth can be seen in the fact that the average American consumes over four times the agricultural inputs (i.e., land, water, and fertilizer) as the average African. The average American consumes about 800 kilograms of grain per year, most of it indirectly as meat, milk and eggs. The average African can afford only about 180 kilograms, mostly consumed as grain and breads. (Brown, 1978, p. 134) The world cannot support as many Americans as it can Africans.

However, not all economic growth is equal in its environmental impact. Thus the linkage between wealth and environmental stress is not as clear-cut as between population growth and environmental stress. For example, substitution of more plentiful raw material inputs for less plentiful ones can reduce the ecological burden of economic growth. Substitution of satellites for transoceananic communications cables and glass filaments for copper telephone wires has meaningfully reduced the resource demands of the telecommunications industry. Increased recycling of some metals, especially aluminum, can reduce the demand for energy as well as alumina ores. (Gribbin, 1979, pp. 142-146) While substitution and recycling cannot push back the physical limits to growth indefinitely (Davis, 1979, pp. 137-138), life styles that are more frugal in these respects do imply that all consumption and all economic growth is not equal.

Likewise, certain types of industries and patterns of consumption are less resource intensive than others. We have lived in a society and an economy based on the production, use and enjoyment of the automobile. This industrial base is incredibly resource-intensive. According to statistics available in the late 1960's, autos consume "20% of all the steel, 12% of the aluminum, 10% of the copper, 51% of the lead, 95% of the nickel, 35% of the zinc, and 60% of the rubber used in the United States." (Mowbray, 1969, p. 15)

Information-age industries and consumption (e.g., computers, and video-entertainment) require fewer, although often scarcer and more exotic, raw material inputs than the auto industry. They create less pollution. In short, growth in these industries, and economic growth based on these industries, does not move a society as much closer to the physical limits of growth as economic development based on the automobile. Thus, while increasing wealth and consumption generally increases stress on the environment, some economic, social and cultural patterns may allow greater room for economic growth than others.[7]

RESPONDING TO SCARCITY: POLITICAL AND ECONOMIC LIMITS

Proposition 6: The critical limits to growth, at least in the near future, are political, economic and cultural.

Proposition 7: The most important economic limit to growth is the availability of investment capital.

To say that physical or natural limits to growth are not of immediate concern is not to say that there are no immediate limits to growth. There are. But they are political, economic and even cultural limits rather than physical ones. Understanding these limits requires of students an appreciation of the politics and economics of everyday life, and an appreciation of the dynamics of cultural change.

The political and economic limits to growth can be seen in dramatic form in relation to the world food issue. By the middle of the next century, the world will have to feed between 8 and 10 billion people according to current estimates. Yet, today, with a global population of only 4.5 billion people, between 400 and 500 million (8-11%) are malnourished. (Newitt, 1983, p. 4)[8] As noted above, we probably possess the technical means today to feed 8-10 billion people. But we are not overwhelmingly successful at feeding 4.5 billion. The problem obviously is not a physical limit to growth. But the problem is almost certain to become more severe as we move closer to the carrying capacity of the planet.

The reasons why we cannot adequately feed 4.5 billion people are largely political and economic. (In certain important respects, they are also cultural.) The malnourished of the world are for the most part those who cannot afford a better diet. The global reach of transportation systems and the world food marketing system could presumably deliver food to anyone who needs it. But in reality it can only reliably deliver food to those who can afford it.

Responding to today's problem, and presumably tomorrow's larger problem, will require finding ways to grow more food. It will also require growing food which people can afford. More accurately, it will require changes which make it possible for people to afford the food, however expensive, that is grown.

The real cost of growing food is likely to rise, not fall, in the future. Increasing food production significantly in many parts of the world will require the use of marginal lands and large inputs of capital to clear forests, drain swamps, or build irrigation systems. It will not be economically possible to grow cheaper food unless new technologies greatly reduce the inputs (e.g., water and fertilizer) needed per unit of food grown. (Brown, 1978, pp. 159-160) The plight of American farmers, caught between low prices on grain markets and the high cost of production (which includes debt burdens and acceptable profit margins in addition to the more obvious costs of food production) reflects this dilemma.

But making it possible for people with marginal incomes, or no incomes, to afford food may be no easier than growing cheap food. Within industrialized, wealthy countries like the United States, it requires great political effort to create and maintain government programs that redistribute income so that those with limited incomes (e.g., the elderly, the chronically underemployed, the

unemployed, children of poor families) can get the food they need.[9] Recent cut-backs in food stamps and other assistance programs reflect the continuing political conflict which redistributive policies create. For the world as a whole, income redistribution in the form of foreign aid is an even more explosive issue.

Feeding the world's hungry may also require more fundamental economic changes. Industrialization and economic growth (to create new jobs) and land reform (to allow the rural poor to meet their own food needs) are important parts of a solution. But past industrialization and economic growth in many Third World countries has not directly benefited the poor, who have gotten poorer in absolute as well as relative terms. (Gribbin, 1979, p. 170) Land reform in countries like El Salvador and Mexico has been an explosive political issue.

The effort to grow more food may also run up against economic and political limits. As noted above, expanding the amount of land under cultivation requires large capital investments. Forests must be cleared. Swamps must be drained. Dry lands must be irrigated. Hillsides must be terraced. The introduction of new farming techniques and technologies must be accompanied by a variety of social and economic investments. Farmers must be educated about new technologies. Investment must be made in new equipment, seed varieties, and, given existing patterns of technology, in ever increasing amounts of fertilizer. Change thus requires large economic investments, particularly if the changes must be made over a relatively short period of time.

The availability of this investment capital may pose the single most significant limit to growth, both economically and politically. Investment capital is needed to respond to virtually every dimension of the ecopolitical challenge. It is needed to expand food production, housing, sanitation and other basic services for a growing population. Economic growth, to expand earning power, requires

investment in productive capacity. Responding to pollution problems requires significant investments in clean-up efforts and in the implementation of new technologies. The very development of new technologies, whether they be new genetic strains of corn, new methods of generating energy, new mining or refining techniques or new ways of reducing pollutants, requires tremendous capital investment.

Because of the diversity and systemic nature of the current limits to growth, the demands being placed on a limited pool of capital may be overwhelming, particularly for capital-poor less developed countries. The scarcity of capital is an acknowledged shadow over the otherwise optimistic images of the future generated by the Sussex University researchers. (Gribbin, 1979, pp. 51-55)

The availability of capital is as much, or more, a political limit to growth as an economic one. Gribbin (1979, pp. 152-153) argues that sufficient capital can be generated but wonders if it will be invested wisely. In part, this concern involves political issues other than ecopolitical challenges as routinely conceived. Capital is, after all, invested in many ways by politico-economic systems. One of the most significant drains on available capital in the world today is the cost of defense.

The world's total investment in the military in 1979 ($478 billion) was about equal to the Gross National Product of the People's Republic of China ($480 billion), and the combined Gross National Products of the 51 countries of Africa and South Asia, including India ($471 billion). It was only somewhat less than the Gross National Products of the 25 Latin American countries ($574 billion) and the world's total investment in education ($546 billion). (Sivard, 1982) Even with the beneficial impact of military research and development on civilian technology, these expenditures clearly divert, whether justifiably or not, an

enormous amount of capital away from efforts to respond to ecopolitical challenges. Rediverting this capital away from the military poses a significant political limit to growth. (Gribbin, 1979, pp. 49-73; Falk, 1972, pp. 126-130)

A DIFFERENTIATED GLOBAL SYSTEM

> Proposition 8: The less industrialized countries face greater immediate limits to growth than the wealthier, more industrialized countries.
>
> Proposition 9: Because of the emergence of global economic, political and social systems, what appear to be local or regional limits to growth have an impact that can be global in scope. Thus while the limits to growth are felt unequally across countries and regions, the problems posed are truly of global concern.
>
> Proposition 10: Continuity in the evolution of the current industrial civilization may be a common interest of the entire global system. However, there are sharp differences in interests and values within that system, and these differences affect decisions about how best to respond to concrete ecopolitical issues.

The marked contrast between the images of the future held by optimists like Hermann Kahn (1976) and pessimists like Lester Brown (1978) is accompanied by an equally marked contrast in the focus of their attention. Kahn and similar prophets of boom have been almost exclusively concerned with the more industrialized world, and to a lesser extent the group of Third World countries experiencing rapid industrial and economic growth. Lester Brown and the prophets of gloom have traditionally focused more attention on the prospects facing mankind's other half. The future prospects of the two, especially taken alone, are radically different. Students must understand the fundamental realities of the global system (i.e., its integration and the stark differences in resources, values and interests subsummed within the system) if they are to understand the global context within which ecopolitical policies must be made.

Differences between industrialized and less industrialized countries with respect to the ecopolitical issues can be clearly seen in their respective population problems. During the next 25 years, for example, the United States, like most of the wealthy, industrialized countries, faces a progressive "greying"

of society. Declining birth rates over the last generation promise to halt population growth. But they will cause the relative size of the over-60 age group to grow considerably during the next decades. The problem is reflected in the current debate over the Social Security System. Fewer and fewer young Americans will be asked to support more and more retired Americans.

But a wealth country like the United States has many resources and alternatives for meeting the challenge. We can borrow from future earnings (i.e., raise the national debt) and thus spread out the cost of the income transfers over a number of generations. We can raise the retirement age or encourage the withholding of capital from individual consumption now (e.g., through IRA's and other retirement plans) in order to minimize the need for income transfers later. Wealth can also be diverted from any number or other uses (e.g., the military) to meet these needs. Further, while Americans face a difficult political problem in the next decades, the problem will last only a generation. Old people do die. As they do, the age distribution of the population will become more equal.

Mexico, like most less industrialized countries, faces a radically different population problem. A high birth rate and declining infant mortality rate has greatly expanded the proportion of the Mexican population under the age of 20. Current wage earners must support this youthful population. The society must invest in their education and in other social infrastructure. As importantly, the economy must create opportunities for productive employment for this army of young people as they enter the work force. If jobs are not created, today's children, rather than becoming a resource for creating wealth, are likely to become an even greater drain on available capital as unemployed adults.

Nor will these problems go away in a generation. Even if population growth rates decline abruptly, the problem has only begun. As today's children enter their childbearing years, the population will grow larger simply because there

are more people having children. It may take several generations before the Mexican population begins to level off, if it ever does.

The options available to Mexican policy makers are less varied than those available to Americans. Mexicans have far less ability to wring investment capital from current consumption or from future earnings. The cost of these young people to Mexican society is already large relative to the productive workforce. There is less total wealth, and therefore less available capital, in the society to invest in economic growth. Finally, since the problem extends over many generations, it is less feasible to borrow against future earnings and incur the inflation and other socio-economic costs that this policy would entail.

Mexico's oil wealth may provide the capital needed to respond to its limits to growth challenge. But Mexico's problem is typical of much of the Third World. So are the apparent constraints Mexico faces. Whether countries without a wealth of raw materials can hope to provide adequate living standards for their growing population, an important factor in reducing birth rates in a society, before they reach the absolute limits to their growth is unclear. It is small wonder that Hermann Kahn felt compelled to write off this economic Fourth World in his image of the future.

The temptation to ignore the radical inequality in the most probable futures faced by the industrialized and the very poor countries may be overwhelming. But the emergence of global economic and political systems has drastically reduced our ability to isolate ourselves from economic, social or political chaos in other parts of the world. Mexico's population problem simply becomes the United States' illegal alien problem as one crosses the border.

In general, decisions and events anywhere in the global system tend to have an impact on other parts of that system. The integration of the world food system provides stark evidence of this interdependence or vulnerability to events elsewhere:

> The winter of 1971-72, with its prolonged low temperatures and strong icy winds all over Eastern Europe, effectively destroyed one third of the Russian winter wheat crop. Surprisingly, the government bureaucracy ignored the situation. The spring wheat acreage allocation remained unchanged. Since the direct per-capita consumption of wheat in that region is rather high (three times higher than in North America), it was urgent that the deficit be eliminated. In July 1972 the U.S. government extended a $750 million credit to the Soviet Union for the purchase of grain over a three-year period. Actually the value of the purchase increased significantly before the delivery got underway since food prices soared all over the world. The price of wheat doubled in North America--hitherto a bastion of cheap food supply. Public resentment rose because people felt that in effect they were being made to pay for a transaction that did not involve the ordinary citizen. More important, and much more unfortunately, that same year's late monsoon heavily damaged the crops on the Indian sub-continent, resulting in a disastrous loss in food supply, which came in the aftermath of a tragic war. Nowhere was wheat to be found, for most of the world's surplus had been sold. Then a drought hit China and Africa and while China was acquiring whatever foodstuffs were on the market, hundreds of thousands of Africans faced starvation. In a similar situation several years earlier, millions of tons of wheat had been rushed from North America to avert disaster; but this time only two hundred thousand tons could be made available.
>
> The most outstanding lesson which can be drawn from these events is a realization of how strong the bonds among nations have become. A bureaucratic decision in one region, perhaps the action of just one individual--not to increase the spring wheat acreage--resulted in a housewives' strike against soaring food prices in another part of the world and in tragic suffering in yet another part of the world. (Mesarovic and Pestel, 1974, pp. 19-20)

The emergence of global economic systems (transportation, trade, communications) has played a significant role in pushing back the limits to growth during the past 200 years. Malthus, as noted above, failed to take into account the ability of new lands in the Americas and elsewhere to grow food for British consumers. Predictions of America's impending resource shortages in the 1940's failed to take into account new sources of raw materials, particularly petroleum, in other parts of the world. American imports of industrial raw materials have grown since those predictions were made, but the depletion of prime resource deposits in the United States has not constituted a limit to growth. Global

systems have, in short, allowed mankind to push back the physical limits to growth that would have been imposed by the inequitable distribution of resources across the world's regions.

The wealthy countries like the United States have benefited more to date from these global economic systems than the less industrialized countries. For the industrialized world the disruption of these systems would reimpose regional limits, resulting at least in higher real prices for both manufactured goods and raw materials. This would result in a lower overall standard of living.

Disruption of global economic systems probably would not be of benefit for the majority of Third World countries either, even though reform of that system has been a key issue in the North-South debate for more than a decade. (Tinbergen, 1976) Beginning with trading systems established in the colonial age and continuing today, economic growth in the Third World has been closely tied to economic growth and consumption within the developed world. Foreign exchange earnings are necessary for Third World countries to pay for imported technology needed for economic development. In some less industrialized countries exports and imports account for the majority of the Gross National Product, the measurable money economy. (Lopez, 1979, pp. 29, 32) Disruption of the global economic system would represent a tremendous discontinuity for these countries. It would cut them off from sources of capital and income needed to respond to the challenge posed by population growth.

The debate over reform within the global economic system reflects a basic but critical characteristic of the global system, and indeed of national and local political systems as well: that different countries and decision-makers have differing values and interests with respect to ecopolitical issues. These differences can be seen in the most basic of debates over our response to the ecopolitical challenge as a whole.

From the point of view of the more industrialized countries, whose populations generally are beginning to stabilize, no-growth policies are becoming realistic responses to the ultimate physical limits to growth. Sustainable societies can be designed which could survive almost indefinitely on the planet's finite resource base. Such policies are hotly debated between ecologists, who value unspoiled wilderness, clean air and minimal human intervention in nature, and many economists, who value growth and its ability to put off questions of economic inequality within and between societies.

From the point of view of Third World policy-makers, no-growth policies within the industrialized world, in contrast to reforms of the international trading system which distribute the benefits of growth more equitably, may appear counter-productive. In a global economic system dependent on growth in the industrialized world to fuel economic development in the less industrialized, no-growth strategies could condemn less developed countries to perpetual inequality in living standards. Thus Third World decision-makers have a keen interest in the results of debates over ecopolitical issues in the industrialized world.

Differences between the advocates of no-growth and the advocates of high growth, and between the advocates of business-as-usual in the world economy and the advocates of radical economic reform, demonstrate the depth of the differences which divide nations, and people with respect to the ecopolitical issues. It is critical in teaching about these issues that students have an opportunity to explore these basic value differences and understand their origin in terms of the structure of the international system. It is equally critical that they have an opportunity to explore their own values and the bases of these values.

THE DIFFUSION OF POWER AND INFLUENCE

> Proposition 11: Not only national governments make important policies with respect to ecopolitical issues. International organizations, business firms, state and local governments--ultimately individual families and people--also make critical policy decisions.

Political, economic and social systems are made up of actors, individuals or institutions which make decisions about how to act within the system. It is easy to discuss the global system as if it were composed merely of national governments. In reality, this is neither an accurate nor an adequate image of the world, particularly in relation to global ecopolitical issues.

A wide variety of actors in addition to national governments make critical policies with respect to ecopolitical issues. Business firms routinely make investment decisions which can increase inequality across regions, or which can lead to more or less resource intensive technologies and products. State and local governments are by and large responsible for developing policies which provide the social infrastructure for growing populations and increased consumption. They must deal with the major routine sources of pollution (i.e., garbage and sewage). International governmental organizations like the International Monetary Fund make policies which make capital more or less available to the less developed countries. Perhaps more importantly, individuals and individual families make a wide range of life-style, family planning and other decisions which in the aggregate either make government policies work or make them fail. Students cannot appreciate nor make meaningful decisions with respect to alternative ecopolitical policies without appreciating this diversity of actors within the global system.

In a sense, the diversity of decision-makers with respect to global ecopolitical issues is a two-edged sword. On the one hand, it greatly complicates efforts to respond to these challenges. Governments of liberal democracies like the United States, often cannot simply conduct ecopolitical policies. They must create incentives which encourage or discourage particular investment and consumption decisions on the part of private businesses or private individuals. Even governments of centrally planned states like the People's Republic of China often face limits on their ability to enforce or control individual responses to their policies. Chinese population policies,

allowing only one child per family, for example, touch on key cultural values favoring large families (in rural areas) and sons. As a result, in rural areas, where enforcement is more difficult but where eighty percent of the Chinese population lives, implementation of the policy is uncertain. Where the policy is effectively enforced, it has led to a variety of social problems, including female infanticide, which government leaders had not intended. (Keyfitz, 1984, p. 47)

On the other hand, the role of non-governmental organizations and individuals in responding to these issues means that citizens have greater ability to participate in determining their future. Pedigogically, the fact that individuals' decisions are an important factor in a society's ability to respond successfully to these issues is a powerful tool

One of the key problems in teaching about global issues, in particular global ecopolitical issues, is the students' apparent inability to do anything about challenges and problems which will have a tremendous impact on their lives. By showing students the role of individuals and local organizations, including government, in responding to these problems, students can both develop a more accurate image of the international system and discover ways of acting on their own concerns. This dimension can increase students' sense of efficacy and interest in world affairs generally. (Woyach and Love, 1983)

CONCLUSION

This paper has not tried to address all the issues that could be raised with respect to the role of materials on ecopolitical issues in the secondary curriculum. Nor has it developed all the criteria which should be used in assessing instructional materials dealing with these issues. It has attempted to provide content guidelines for teachers and curriculum decision-makers who wish to address these issues within the existing curriculum.

The eleven propositions articulated here provide a general map to the key concepts and key issues around which the limits to growth debate rages. They also provide insights into the various disciplinary bases of these issues (e.g., science and engineering with respect to the impact and development of technology, political science with respect to the political limits and context of the issues, economics with respect to the economic dynamics of resource utilization and development, etc.) They do not, however, provide the last word or the only word in these respects. It is hoped that this paper will provide a catalyst drawing greater attention to these basic questions.

This attention is needed and overdue. Global ecopolitical issues are being dealt with in the curricula of our schools. In terms of the quality of the information and the theory underlying materials, in terms of the understanding which teachers bring to the materials, the treatment is probably highly uneven. But the effort to include these critical issues in the curriculum is critical if today's students and tomorrow's citizens are to deal with them effectively as adults.

Equally critical is the need for a serious effort to provide teachers and other curriculum decision-makers with guidance as to the fundamentals of the limits to growth debate, and to the social, political and economic context of that debate. Without an acceptable set of content criteria which help decision-makers assess curriculum materials and assess the place of those materials within the overall curriculum, the schools' performance with respect to teaching these issues can never hope to be completely adequate.

NOTES

1. Concerns about the scarcity of food and other material needs of society have certainly been a fundamental element in human history from its beginning. However, the scientific revolution, with its advances in medical science and industrial production, have changed both the nature and the persistence of these concerns. Medical science has allowed an expansion of human population unheard of in previous human history. This expansion was just beginning to become visible in Malthus' 18th century Britain. The worldwide explosion of industrial civilization was beginning in the 1940's at a time when many known deposits of industrial raw materials in the U.S. were beginning to reach points of economic exhaustion. Increasing concern was expressed at that point about scarcity and the inevitable dependence on foreign sources of raw materials which domestic scarcity would encourage.

2. Although the NCSS guidelines for science-related social issues notes the importance of teaching "concepts and principals" in relation to these issues, those guidelines say nothing about what the important concepts and principals are. More surprisingly, the analysis of the ways in which limits to growth issues are treated in high school social studies texts offers little help in this regard as well. Newitt (1983, pp. 2-6) articulates only very general criteria (i.e., the adequacy and objectivity of the materials) and then goes on to raise only very specific content issues (e.g., in dealing with population do textbooks refer to world population as growing "rapidly" or at an "ever increasing rate"). These criteria are not very useful in designing or in evaluating curriculum materials in terms of their overall treatment of these issues.

3. Again, the NCSS guidelines refer to the importance of decision-making skills but do not elaborate on them. A very good treatment of these skills, which this author also regards as critical, is contained in Remy, 1980. Remy includes within this domain skills related to (a) acquiring and using information, (b) assessing the involvement of oneself and others, (c) making decisions, (d) making judgments, (e) communicating judgments, concerns and viewponts, (f) cooperating with others in efforts to define and deal with issues, and finally (g) promoting one's interests with respect to these issues.

4. There are those who argue that unlimited growth, even of population, is possible. A well-documented example of this position is contained in Simon, 1981. But this position is not held by any of the global modelers. In his introductory arguments, Gribbin (1979) notes the convergence among the major world future modelers (e.g., Kahn, Club of Rome, Sussex University team) in recent years regarding these basic points. Simon's arguments, while heroically documented, are largely based on economic theory and the historical experience of the developed world. This is not an adequate theoretical or data base for analyzing these ecopolitical issues. It is particularly inadequate for projecting alternative futures.

5. Ophuls (1977, pp. 156-163) contains a more radical rejection of technology as a solution to the limits to growth. Ultimately, however, it is clear that a fundamental basis of his objection is contained in what he regards as the Faustian bargain implicit in technological solutions. As the scale and scope of scarcity enlarges, the need to turn ever increasing grants of authority over to the technological experts grows. In addition, social organization begins to be governed by the need to feed the technology-producing machine and to protect

ourselves from the social and ecological consequences of technology (e.g., protecting nuclear fuels from prospective terrorists). As a result, the quality of life declines even though a high material standard of living is maintained further into the future.

6. There has been little apparent attention to the impact of the emerging global system on the ability of industrial society to keep prices down and scarcity at bay. Yet, this may be a key question since we have certainly reached the limits of our ability to expand the global trading system except through economic growth. The issue has important ramifications. Most optimists with respect to the limits to growth cite the decline in the relative cost of raw materials over the past few decades, for example, as evidence that technology has kept scarcity at bay. But they make no effort to separate out different causal factors in an obviously complex economic equation. The relative decline in prices (note that this is not a decline in absolute prices) is certainly due in part to the development of new sources of raw materials, and the ability of workers in the developed world to expand their income and living standards to an extent not possible in the less developed world (a major source of industrial raw materials although hardly the only one). Technological improvements surely have played some role here, but that role in quantitative terms is unclear.

7. This is not to argue that a post-industrial society could be constructed which would be based on service industries and not on the consumption of raw materials. Davis (1979, pp. 88-89) and Gribbin (1979, pp. 208-212) contain excellent analyses which indicate the dependence of service industries on a varied and broad base of manufacturing (i.e., resource consumption).

8. Newitt attributes this figure, which must be taken as a conservative estimate, from UN and World Bank sources without citations. Good estimates of the world's malnourished are hard to come by because of counting problems and definitional problems. Praiges (1978, p. 77) reports a much higher figure citing 1976 sources. He claims that 900 million people (20%) fall 250 calories short each day and that 1.3 billion (29%) are chronically malnourished.

9. It could be argued that the political will required of the welfare state is even greater in socialist countries where entire state systems exist to develop, operate and enforce redistributive policies.

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